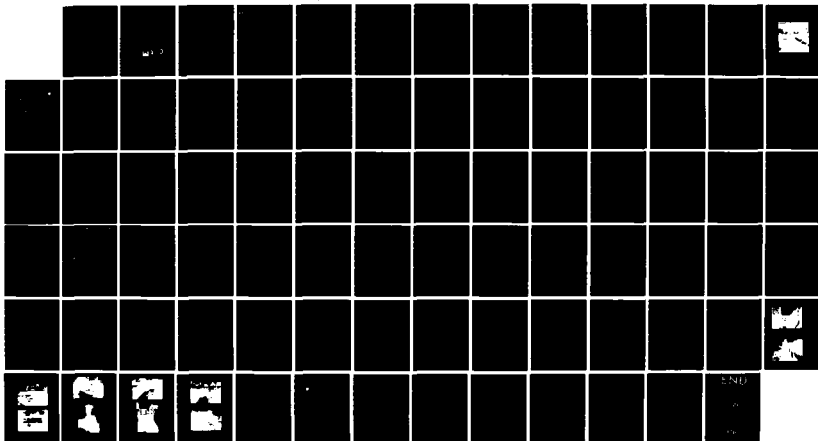


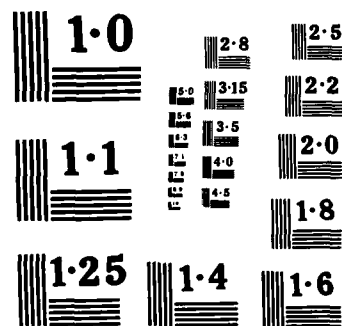
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
PIERCE POND DAM (MA 0. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUN 80

ML

F/G 13/13

NL





NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

①

AD-A155 806

MERRIMACK RIVER BASIN
LEOMINSTER , MASSACHUSETTS

PIERCE POND DAM
MA 00883

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**



DTIC
ELECTE
JUL 03 1985
S
G

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JUNE 1980

DISPATCH CENTERMENT A
Approved for public release
Distribution Unlimited

DTIC FILE COPY

85 06 7 04 0

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00883	2. GOVT ACCESSION NO. AD-A155806	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Pierce Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE June 1980
		13. NUMBER OF PAGES 65
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Merrimack River Basin Leominster, Massachusetts Monoosnoc Brook, tributary of the North Nashua River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a 470 ft. long earthfill dam with a maximum height of 14 ft. There are deficiencies which must be corrected to assure the continued performance of the dam. Generally the dam is in poor condition. It is small in size with a hazard potential of high.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED-E

DEC 17 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts

Dear Governor King:

Inclosed is a copy of the Pierce Pond Dam (MA-00883) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Pierce Pond Dam would likely be exceeded by floods greater than 18 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

NEDED-E

Honorable Edward J. King

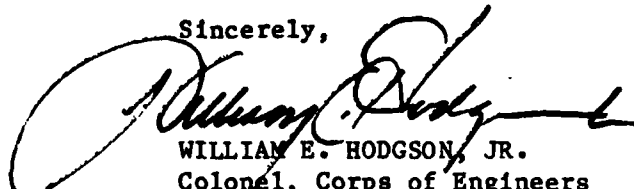
I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. This report has also been furnished to the owner of the project, Mrs. Nina Cohen, Leominster, Mass.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for the cooperation extended in carrying out this program.

Sincerely,


WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Division Engineer

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A/1	



PIERCE POND DAM

MA 00883

MERRIMACK RIVER BASIN
LEOMINSTER, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA 00883

Name of Dam: Pierce Pond Dam

Town: Leominster

County and State: Worcester County, Massachusetts

Stream: Monoosnoc Brook, tributary of the North
Nashua River

Date of Inspection: May 14, 1980

Pierce Pond Dam is a 470-foot long earthfill dam built in 1911. The dam has a maximum height of 14 feet and consists of a spillway, low-level outlet, and abandoned wheel house. The top of the dam is at Elevation (El) 473.7. The spillway is a concrete and stone, round-crested weir, 50.2 feet long, with the crest at El 470.7. The outlet is 3 feet wide by 2.3 feet high, and is normally controlled by a slide gate with a rack and pinion mechanism. The invert of the outlet is at El 461.0. The outlet is presently closed and the slide gate inoperable.

There are deficiencies which must be corrected to assure the continued performance of this dam. This conclusion is based on the visual inspection of the site and a review of the available data. Generally the dam is in poor condition.

The following deficiencies were observed at the site: closed and inoperable low-level outlet; erosion on both upstream and downstream slopes of the embankment, particularly adjacent to the spillway abutments; animal burrows on the dam; riprap missing from the upstream face of the dam; severely spalled and eroded concrete on the left side wall of the spillway, adjacent to the low-level outlet; severe leakage in the same area; heavy growth of brush and trees on the slopes of the embankment; and severely deteriorated concrete on the wheel house.

Based on Corps of Engineers' guidelines, the dam has been classified in the small size and high hazard categories. A test flood equal to one-half the probable maximum flood (PMF) was used to evaluate the capacity of the spillway. The test flood outflow is 2,350 cfs, resulting in a pond level at El 475.0. The test flood would overtop the dam by 1.3 feet. Hydraulic analyses

PIERCE POND DAM

indicate that the spillway can discharge 850 cfs, or 36 percent of the test flood outflow before the dam is overtopped.

It is recommended that the Owner employ a qualified registered professional engineer to conduct a more detailed hydraulic and hydrologic study for the dam, and evaluate the stability of both the embankment and the spillway. The investigations should include recommendations for selective clearing and backfilling of the embankment, and repair of the concrete wall at the outlet. In addition, the Owner should repair the deficiencies listed above, as described in Section 7.3. The Owner should also implement a program of annual technical inspections, a plan for surveillance of the dam during and after periods of heavy rainfall, and a plan for notifying downstream residents in the event of an emergency at the dam.

The measures outlined above and in Section 7 should be implemented by the Owner within a period of 1 year after receipt of this Phase I Inspection Report.



A handwritten signature in cursive script, reading "Edward M. Greco".

Edward M. Greco, P.E.
Project Manager
Metcalf & Eddy, Inc.

Massachusetts Registration
No. 29800

Approved by:

A handwritten signature in cursive script, reading "Stephen L. Bishop".

Stephen L. Bishop, P.E.
Vice President
Metcalf & Eddy, Inc.

Massachusetts Registration
No. 19703



PIERCE POND DAM

This Phase I Inspection Report on Pierce Pond Dam (MA-00883) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.



ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division



CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division



RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general conditions and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

PIERCE POND DAM

TABLE OF CONTENTS

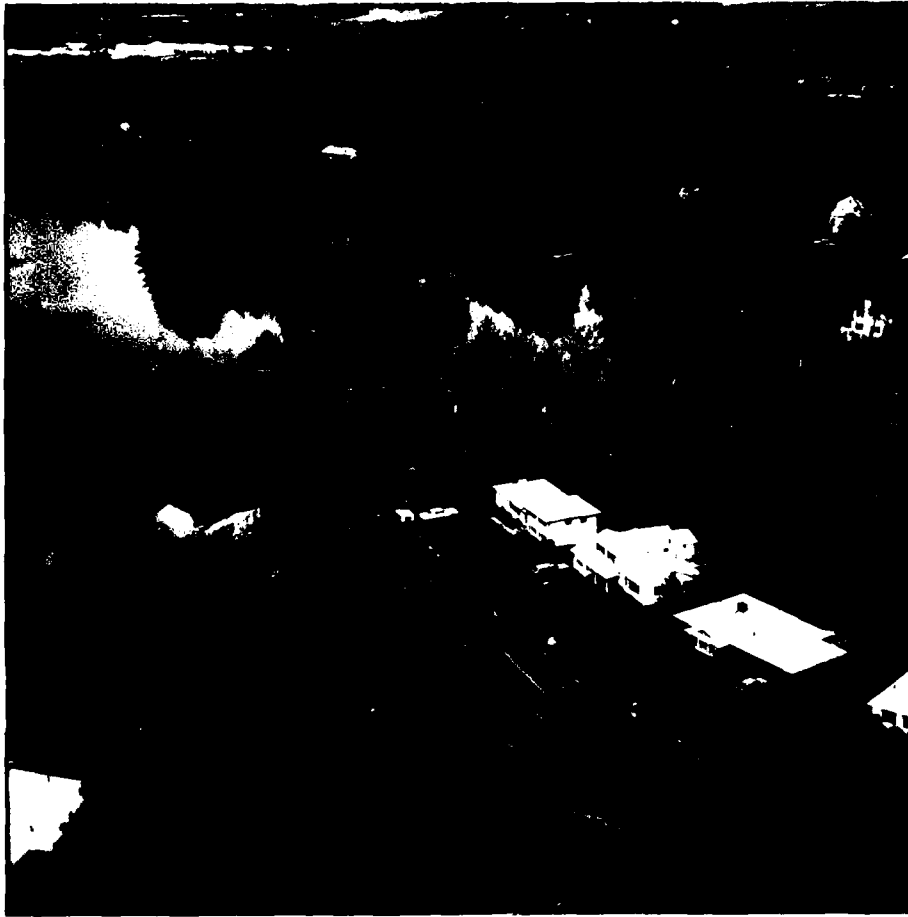
	<u>Page</u>
BRIEF ASSESSMENT	i
PREFACE	iv
OVERVIEW PHOTO	vii
LOCATION MAP	viii
REPORT	
SECTION 1 - PROJECT INFORMATION	1
1.1 General	1
1.2 Description of Project	1
1.3 Pertinent Data	4
SECTION 2 - ENGINEERING DATA	8
2.1 General	8
2.2 Construction Records	8
2.3 Operating Records	8
2.4 Evaluation	8
SECTION 3 - VISUAL INSPECTION	9
3.1 Findings	9
3.2 Evaluation	10
SECTION 4 - OPERATING AND MAINTENANCE PROCEDURES	11
4.1 Operating Procedures	11
4.2 Maintenance Procedures	11
4.3 Evaluation	11
SECTION 5 - EVALUATION OF HYDRAULIC/ HYDROLOGIC FEATURES	12
5.1 General	12
5.2 Design Data	12
5.3 Experience Data	12
5.4 Test Flood Analysis	12
5.5 Dam Failure Analysis	13

PIERCE POND DAM

TABLE OF CONTENTS (Continued)

	<u>Page</u>
SECTION 6 - STRUCTURAL STABILITY	14
6.1 Visual Observations	14
6.2 Design and Construction Data	14
6.3 Post Construction Changes	14
6.4 Seismic Stability	14
SECTION 7 - ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES	15
7.1 Dam Assessment	15
7.2 Recommendations	15
7.3 Remedial Measures	16
7.4 Alternatives	17
APPENDIXES	
APPENDIX A - PERIODIC INSPECTION CHECKLIST	
APPENDIX B - PLANS OF DAM AND PREVIOUS INSPECTION REPORTS	
APPENDIX C - PHOTOGRAPHS	
APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS	
APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS	

OVERVIEW
PIERCE POND DAM
LEOMINSTER, MASSACHUSETTS



small, high hazard dam is one-half to full PMF (Probable Maximum Flood). The height of the dam and the maximum storage in the pond puts the dam at the lower end of the size scale, therefore a test flood equal to one-half the PMF should be used to evaluate the capacity of the spillway.

The PMF inflow rate to Pierce Pond was based on the Corps of Engineers report "Hydrologic Analysis for Monoosnoc Brook Flood Control". The report contains an outflow hydrograph for Notown Reservoir and an inflow hydrograph to Rockwell Pond for the area below Notown Reservoir under a Standard Project Flood. The standard project flood is equivalent to one-half PMF. The report data was adjusted and the two hydrographs combined to develop a peak test flood inflow to Pierce Pond of 2,520 cfs. By adjusting the test flood inflow for surcharge storage, the peak test flood outflow was calculated to be 2,350 cfs (325 cfs per square mile).

Hydraulic analyses indicate that the spillway can discharge 850 cfs or 36 percent of the test flood outflow with the pond at El 473.7, which is the low point on the top of the dam.

During the test flood, the pond level would rise to El 475.0, and the low point on the dam would be overtopped by 1.3 feet. About 1,480 cfs would discharge over the spillway, and about 870 cfs would discharge over the dam. Where critical flow occurs at the low point, the water would be 0.8 feet deep at a velocity of 5 feet per second (fps).

- 5.5 Dam Failure Analysis. The peak discharge rate due to failure of the dam was calculated to be 4,090 cfs with the pond at El 473.7. This calculation is based on a maximum head of 13.7 feet and an assumed 38-foot wide breach occurring in the left (easterly) embankment. Failure of the dam would produce a flood wave 9.0 feet deep about 400 feet downstream, as compared to channel flow 5.8 feet deep prior to failure. It would take about 71 minutes to drain the pond.

There are several private homes located along the stream just downstream of the dam and Lindell Avenue. The foundations of these structures are approximately 5 feet above the floor of the stream. Due to the configuration of the channel, little attenuation of the flood flow is possible before there is an impact on the structures. It is likely that failure of the dam would result in property damage and loss of more than a few lives in the developed areas downstream of the dam. Accordingly, the dam has been placed in the "high" hazard category.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

- 5.1 General. Pierce Pond Dam has a drainage area of 7.2 square miles of which about 7.2 percent is ponds and swamps (see Figure D-1, Drainage Area Map). The watershed is hilly and lightly developed. Notown Reservoir, upstream of Pierce Pond, provides considerable storage for 4.7 square miles of the watershed.

Pierce Pond has a surface area of approximately 24 acres, and a maximum storage capacity of 158 acre-feet at El 473.7.

If operable the low-level outlet could discharge a flow of 95 cfs when the pond is at El 470.7 which is the crest of the spillway. Starting at this pond elevation and with no additional inflow, the outlet could lower the pond by 1 foot in about 3 hours.

- 5.2 Design Data. There are no hydraulic or hydrologic computations available for the design of the spillway at Pierce Pond Dam.
- 5.3 Experience Data. There is no record of overtopping of the present dam, which was constructed in 1911. A dam inspection report from the Worcester County Engineering Department states that during the 1938 hurricane, water "just missed going over the embankment". Another report stated that the spillway was inadequate to handle "flood waters, "...water goes across road to Fitchburg at low place". There is no further information on where this flooding occurred.

Records of past discharge are available for the U.S. Geological Survey gaging station located about 6 miles downstream on the North Nashua River. The records date back to 1935 and indicate that the maximum discharge occurred on March 19, 1936. A hydrologic analysis of Monoosnoc Brook in Leominster was performed by the Corps of Engineers in October 1976. In their report, the Corps calculated that the 1936 flood produced a peak discharge of 1885 cfs at Rockwell Pond Dam, which is about 1 mile downstream. The drainage area for Rockwell Pond is 10.4 square miles. The maximum discharge at Pierce Pond Dam, based on the ratio of the drainage areas alone, is 1,305 cfs.

- 5.4 Test Flood Analysis. Pierce Pond Dam has been classified in the "small" size and "high" hazard categories. Based on the Corps of Engineers guidelines, the range of test floods for a

PIERCE POND DAM

SECTION 4
OPERATING AND MAINTENANCE
PROCEDURES

4.1 Operating Procedures

- a. General. There are presently no operable facilities and no regular operating procedures for this dam.
- b. Warning System. There is no warning system in effect at this dam.

4.2 Maintenance Procedures

- a. General. The Owner is responsible for maintenance of the facility, but the dam is generally poorly maintained. Periodic inspections by the Worcester County Engineering Department have been conducted in the past. Extensive repairs to the concrete were made in 1949, but since then the structure has deteriorated and no other work has been done. Typical maintenance procedures such as backfilling eroded areas on the dam, clearing brush and trees from the slopes and discharge channel, and clearing debris from the spillway and outlet intakes have been neglected.
- b. Operating Facilities. There are no procedures for regular maintenance of the operating facilities at the dam. The gate on the low-level outlet has reportedly been inoperable since at least 1954.

- 4.3 Evaluation. There are no regular programs of maintenance or technical inspections at the dam. There are also no plans for surveillance of the dam during periods of heavy rainfall, or for warning people in downstream areas in the event of an emergency at the dam. The lack of standard operating and maintenance procedures is undesirable, considering that the dam is in the "high" hazard category. These programs should be implemented as recommended in Section 7.3.

PIERCE POND DAM

is not in operating condition, and parts of the operating mechanism are rusted and missing. The discharge end of the outlet is blocked by the slide gate, and although no flow was noted through the gate, a considerable amount of leakage occurs through the wall, in the vicinity of the outlet.

As shown in Photos Nos. 5, 6, and 7 the flume, outlet and wheel house are in very poor condition. There is severe spalling and deterioration of the concrete in the flume and in the foundation of the wheel house. The exposed reinforcing steel is exposed in areas. There is a significant amount of clear water leaking through the concrete walls. There is a bar rack in the flume, but it is submerged and could not be examined.

The wheelhouse is not used and is in such poor condition as to be potentially hazardous to anyone entering it.

- d. Reservoir Area. The reservoir area is lightly developed. Most of the residential development is located on the south and east sides of the pond. The land is wooded with 0.5 to 5 percent slopes. There is some potential that future development will occur in the pond area.
- e. Downstream Channel. (See Photo nos. 4 and 9). Both the spillway and outlet discharge into the downstream channel. The vertical stone masonry walls that form the sides of the channel are in good condition. Two clay drainage pipes are visible in the base of the channel walls, as shown on Figure B-1. Some flow was visible from the 4-inch pipe, on the right wall, and slight iron staining occurs on the rock and soil below it. There was no water flowing from the 10-inch pipe on the left wall, at the time of the inspection. The floor of the channel is covered with cobbles and boulders. Except for a few tree trunks, there is very little debris on the floor of the channel. Trees and brush are overhanging both sides of the channel. (see Photograph Nos. 9 and 10).

A bridge crosses the channel about 90 feet downstream of the dam. The abutments of the bridge restrict the flow in the channel. The waterway opening under the bridge is 5 feet high by 37.4 feet wide.

- 3.2 Evaluation. The visual inspection indicates that the dam is in poor condition. The stated deficiencies which must be corrected to assure the continued performance of this dam and measures to improve this condition are stated in Section 7.

SECTION 3
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I Inspection of the dam at Pierce Pond was performed on May 14, 1980. A copy of the inspection checklist is included in Appendix A. Previous inspections were conducted by the Worcester County Engineering Department from 1924 to 1969. Copies of those reports are given in Appendix B. Selected photographs taken during our visual inspection are included in Appendix C.
- b. Dam. The dam is a earthfill structure with a spillway, flume, outlet, and wheel house that originally housed a turbine. No seepage was noted through the earthfill section of the dam, although minor seepage has been reported by inspectors in the past.

Although the top of the dam is clear, brush and trees from 3 to 24 inches in diameter are growing on both slopes (see Photos No. 1 and 2). In other areas, moderate to severe erosion has exposed a network of tree roots protruding through the soil. Two animal burrows were observed on the crest of the dam.

Many pieces of riprap are missing or dislodged from the upstream face of the embankment (see Photo No. 2). Some areas still protected by riprap are visible below the water line, but the cover does not appear to be continuous.

- c. Appurtenant Structures. The spillway is a concrete and stone, round-crested weir without flashboards. At the time of the inspection, water was discharging over the spillway, so the weir, apron and downstream toe could not be examined. The concrete on the crest of the spillway appeared to be in fair condition. The concrete side walls of the spillway are cracked and spalled, particularly at the base of the walls, where they intersect the weir. A walkway over the spillway was reportedly removed as part of the 1949 repair work. Remains of the central concrete pier are still visible on the crest of the spillway.

Only the discharge end of the low-level outlet was visible during inspection. The slide gate on the outlet

PIERCE POND DAM

SECTION 2

ENGINEERING DATA

- 2.1 General. The engineering data available for this Phase I inspection is limited to one drawing dated April 7, 1911 prepared by Parker, Bateman and Chase, Civil Engineers (see Figure B-2). The drawing was obtained from the Worcester County Engineers Office. There are no other drawings, specifications, or computations available from the Owner, State, or County agencies. Copies of previous inspection reports dated 1924 to 1969, prepared by the Worcester County Engineering Department, are included in Appendix B.

We acknowledge the assistance and cooperation of personnel from the Massachusetts Department of Environmental Quality Engineering, Division of Waterways; the Massachusetts Department of Public Works; and the Worcester County Engineers Office. In addition, we acknowledge the assistance of Mr. and Mrs. Stanley Ricker, who operate a day camp on Pierce Pond, and provided some information on the history and operation of the dam.

- 2.2 Construction Records. There are no construction records or as-built drawings available for the dam or appurtenances. Previous inspection reports by the Worcester County Engineering Department provided some construction information, and a summary of repairs made at the site in 1949.
- 2.3 Operating Records. No operating records are available, and there is no daily record kept of the elevation of the pool or rainfall at the dam site.
- 2.4 Evaluation
- a. Availability. There is limited engineering data available for this dam.
 - b. Adequacy. The lack of detailed hydraulic, structural and construction data did not allow for a definitive review. Therefore, the evaluation of the adequacy of this dam is based on the visual inspection, past performance history, and engineering judgment.
 - c. Validity. Comparison of the available drawing with the field survey conducted during the Phase I inspection indicates that in general the available information is valid.

- (4) Gates: none
- (5) Upstream channel: 50.2 feet wide with concrete wingwalls
- (6) Downstream channel: channel narrows from 48.5 feet to 37.4 feet at Lindell Avenue bridge 90 feet downstream. Vertical dry-stony masonry sidewalls, and streambed of boulders and cobbles.

j. Regulating Outlets

- (1) Invert El: 461.0 (downstream)
- (2) Size: 3 feet x 2.3 feet
- (3) Description: outlet is a rectangular opening in the spillway/flume sidewall, just upstream of wheel house
- (4) Control mechanism: slide gate normally operated by rack and pinion mechanism; presently wheel is missing and gate is closed and inoperable

f. Reservoir Surface (acres)

- (1) Normal pool: 24
- (2) Flood-control pool: N/A
- (3) Spillway crest: 24
- *(4) Test flood pool: 24
- *(5) Top of dam: 24

g. Dam

- (1) Type: earthfill
- (2) Length: 470 feet
- (3) Height: 14 feet
- (4) Top width: 10 feet
- (5) Side slopes: upstream 2.5:1
(Horizontal:vertical)
downstream 2:1
(horizontal:vertical)
- (6) Zoning: none known
- (7) Impervious core: concrete
- (8) Cutoff: core wall extends down to approximately 6 feet below base of dam
- (9) Grout curtain: none

h. Diversion and Regulating Tunnel: N/A

i. Spillway

- (1) Type: rounded crest, stone and concrete stepped downstream apron
- (2) Length of weir: 50.2
- (3) Crest elevation: 470.7

*Based on the assumption that the surface area will not significantly increase with changes in pool elevation from 473.7 to 475.

PIERCE POND DAM

c. Elevation (feet above National Geodetic Vertical Datum of 1929 (NGVD)). A benchmark was established at El 470.7 on the crest of the spillway. This elevation is 1.62 feet lower than El 472.33 (City of Leominster datum) shown on a 1935 plan and profile entitled Upper Merriam Avenue Trunk Sewer. (The adjustment of -1.62 feet to the City datum was obtained from the National Geodetic Vertical Datum of 1929).

- (1) Streambed at toe of dam: 460.0
- (2) Bottom of cutoff: unknown
- (3) Maximum tailwater: unknown
- (4) Normal pool: 470.7
- (5) Full flood control pool: N/A
- (6) Spillway crest (ungated): 470.7
- (7) Design surcharge (Original Design): unknown
- (8) Top of dam: 473.7 to 474.5
- (9) Test flood surcharge: 475.0

d. Reservoir (Length in feet)

- (1) Normal pool: 2,100
- (2) Flood control pool: N/A
- (3) Spillway crest pool:
- (4) Top of dam: 2,100
- (5) Test flood pool: 2,100

e. Storage (acre-feet)

- (1) Normal pool: 86
- (2) Flood control pool: N/A
- (3) Spillway crest pool: 86
- (4) Top of dam: 158
- (5) Test flood pool: 194

PIERCE POND DAM

that were recommended and/or noted by the Worcester County inspector at that time.

1. Normal Operating Procedures. There are no operating procedures at Pierce Pond. The slide gate on the low-level outlet is inoperable, and the outlet from the wheel house is plugged with concrete. The pond level was reportedly lowered in 1950 to facilitate installation of a sewer in the vicinity of the left abutment.

1.3 Pertinent Data

- a. Drainage Area. The drainage area is approximately 4,631-acres (7.23 square mile) and consists of generally hilly topography (see Figure D-1 in Appendix). The drainage area includes Notown Reservoir, which is a public water supply, and several smaller ponds on Monoosnoc Brook (see Figure D-1).

About 20 percent of the drainage area is ponds and swamps. The undeveloped portions of the watershed consist of approximately 90 percent woodland, and 10 percent open fields. Moderate residential development occurs north of Pierce Pond, in the City of Fitchburg.

- b. Discharge. Discharge from Pierce Pond Dam flows over the crest of the spillway and into a stone-lined discharge channel. There is no discharge from the outlet, which is permanently closed.

- (1) Outlet: Size: 3.0 x 2.3 feet; Invert El.: 461.0, Discharge capacity: 95 cfs.
- (2) Maximum known flood at damsite: unknown.
- (3) Ungated spillway capacity at top of dam: 850 cfs at El 473.7.
- (4) Ungated spillway capacity at test flood elevation: 1,480 cfs at El 475.0.
- (5) Gated spillway capacity at normal pool elevation: N/A
- (6) Gated spillway capacity at test flood elevation: N/A
- (7) Total spillway capacity at test flood elevation: 1,480 cfs at El 475.0.
- (8) Total project discharge at test flood elevation: 2,350 cfs at El 475.0.

PIERCE POND DAM

A second gate at the end of the flume controls flow to a penstock which leads to the turbine. Most of the power generating equipment has deteriorated or is missing. The outlet from the turbine, which is located in the west wall of the wheel house, has been blocked with an exterior concrete wall.

- c. Size Classification. Pierce Pond Dam is classified in the "small" category since it has a maximum height of 14 feet and a maximum storage capacity of 158 acre-feet.
- d. Hazard Classification. There are several single family homes located along the Monoosnoc Brook in the residential area immediately downstream of the dam (see Flood Impact Area shown on the Location Map). The foundation sills of these structures are approximately 5 feet above the floor of the stream. There is also a tennis court belonging to a summer day camp at the downstream toe of the dam. An assumed failure of the dam would produce a flood 9 feet deep about 400 feet downstream, as compared to channel flow 5.8 feet deep prior to failure. It is possible that more than a few lives could be lost and a significant amount of property damage could occur. Accordingly, the dam has been placed in the "high" hazard category.
- e. Ownership. The dam is owned by Mrs. Nina Cohen, 746 West Street, Leominster, Massachusetts 01453. Mr. Bert Cohen (telephone 617-343-6973) granted permission to enter the property and inspect the dam.
- f. Operator. There is no operator at the dam.
- g. Purpose of the Dam. Pierce Pond Dam was built to provide a recreational pond for the original owner. The pond is presently used for recreation by local residents.
- h. Design and Construction. Construction of Pierce Pond Dam was completed in 1911. One drawing dated April 7, 1911 and prepared by Parker, Bateman & Chase, Civil Engineers, is available. The drawing indicates that the dam and spillway were constructed essentially as it appears today.

Previous inspection reports indicate that since construction, the dam has been in fair to poor condition. Repairs were made in 1949, including adding a second thickness of concrete to the spillway/flume side wall. Also at that time, a walkway over the spillway was taken down, and the central concrete pier removed. Page B-20 in the Appendix is a brief description of the repairs

PIERCE POND DAM

- b. Description of Dam and Appurtenances. Pierce Pond Dam is a 470-foot long, earthfill dam with a maximum height of 14 feet (see Plan of Dam and Sections in Appendix B and photographs in Appendix C). The top of the dam is 10 feet wide and varies from El 473.7 to 474.5. The upstream face is a 2.5:1 (horizontal vertical) slope covered with riprap up to El 473. The downstream face is a 2:1 slope covered with brush, trees, and leaves. The only available drawing does not indicate any zoning of the embankment other than a central concrete core wall (see Figure B-2). The base of the core wall is shown to extend approximately 6 feet below the base of the dam.

The spillway, located near the center of the dam, is a 50.2-foot long, round-crested concrete and stone masonry weir. The approach channel consists of parallel concrete training walls which extend into the pond. According to Figure B-2, the floor of the approach channel is paved with riprap.

The concrete crest of the spillway is at El 470.7. There are no stoplogs or flashboards on the crest. The downstream slope of the spillway consists of two steps of fieldstone, with a partial concrete apron. The discharge channel below the spillway is 48.5 feet wide at the maximum, and narrows to 30.2 feet wide approximately 50 feet downstream. The sides are 4-foot high vertical dry stone masonry walls for a distance of approximately 60 feet downstream. The floor of the channel contains boulders and cobbles and slopes at 0.5 percent.

A clay pipe discharges from the base of each wall of the channel. The 10-inch pipe on the left wall, just downstream of the wheel house, is reportedly the outlet from a nearby leaching field. The 4-inch pipe on the right wall is presumably for drainage.

The low-level outlet, which is 3 feet wide by 2.3 feet high, is located at the base of the left spillway side wall. This is also the west wall of a concrete flume that was originally designed to conduct flow to a turbine. Flow into the flume, towards the outlet, is uncontrolled. Discharge from the outlet, however, is controlled by a slide gate, which is closed. The rack and pinion mechanism for operating the slide gate is mounted on the top of the wall, inside the flume (see Photos 5, 7, and 8). The invert of the low-level outlet is at El 461.0, and under normal conditions water flowing through the outlet would discharge into the spillway channel.

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

PIERCE POND DAM

SECTION 1

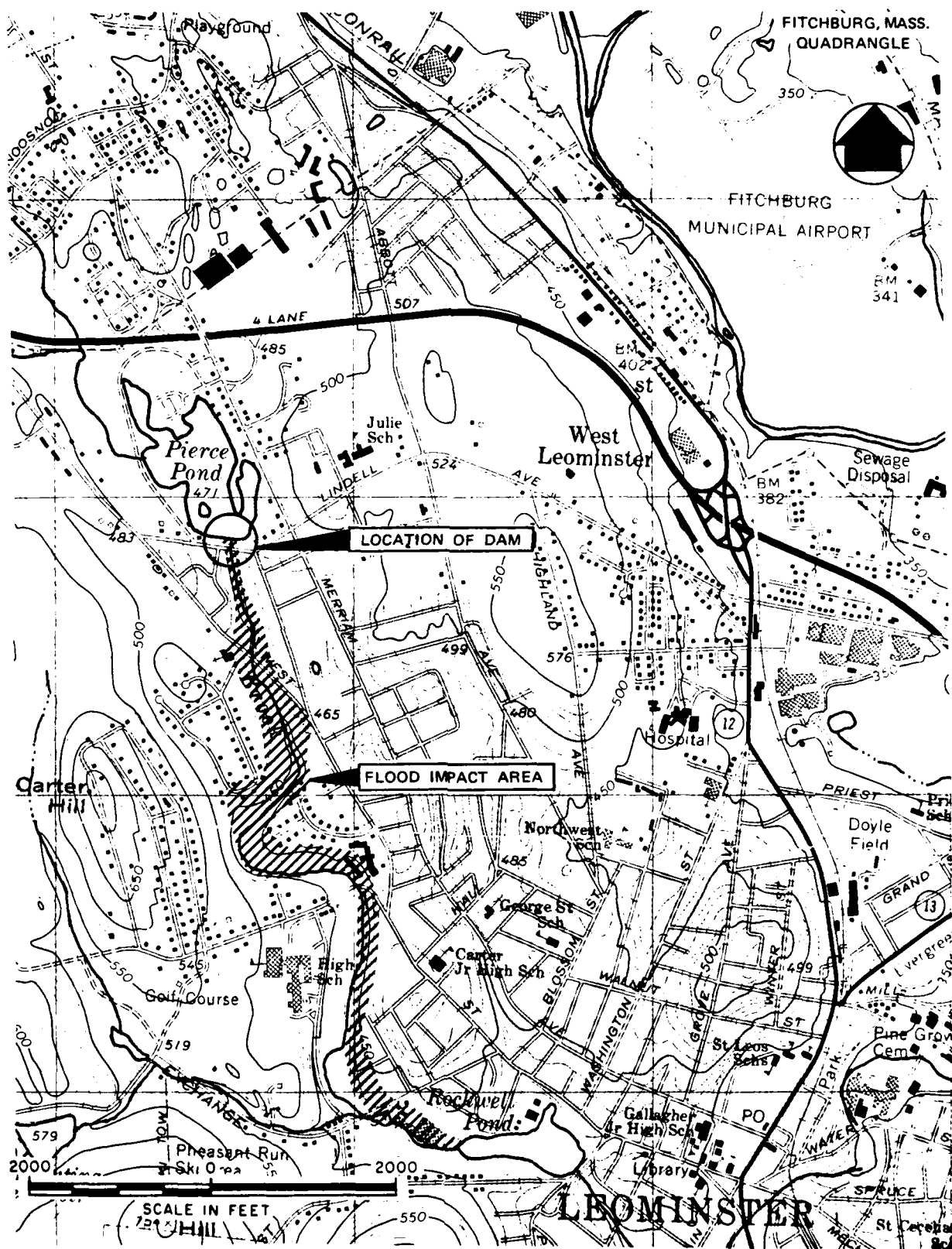
PROJECT INFORMATION

1.1 General

- a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Contract No. DACW 33-80-C-0054, dated April 18, 1980, has been assigned by the Corps of Engineers for this work.
- b. Purpose
 - (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
 - (2) Encourage and assist the States to quickly initiate effective dam safety programs for non-Federal dams.
 - (3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

- a. Location. The dam is located in the Merrimack River Basin on Monoosnoc Brook which drains into North Nashua River in the Town of Leominster, Worcester County, Massachusetts (see Location Map). The coordinates of this location are Latitude 42 deg. 32.3 min. north and Longitude 71 deg. 46.9 min. west.



LOCATION MAP – PIERCE POND DAM

SECTION 6

STRUCTURAL STABILITY

- 6.1 Visual Observations. The evaluation of the structural stability of Pierce Pond Dam is based on a review of previous inspection reports, a review of available drawings, and the visual inspection conducted on May 14, 1980.

As discussed in Section 3, Visual Inspection, the dam is in poor condition. Areas of erosion were observed on the crest and upstream slope of the dam. A thick growth of trees and vegetation covers both the upstream and downstream slopes.

- 6.2 Design and Construction Data. Construction of Pierce Pond Dam was completed in 1911. Computations for design of the dam, spillway and outlet are not available.

One drawing dated April 7, 1911, prepared by Parker, Bateman and Chase show the proposed construction of the dam (see Figure B-2). The drawing indicates that the dam is an unzoned earthfill embankment, with a concrete core wall located along the centerline of the dam. The core wall extends approximately 6 feet below the base of the dam. The side slopes of the embankment are 2.5:1 upstream and 2:1 downstream.

Specifications for construction of the dam are not available.

There is no information of the shear strength or permeability of the soil and/or rock materials of the embankment.

- 6.3 Post-Construction Changes. Since the original construction of the dam, no apparent changes or repairs have been made to the embankment. Most of the repair work, which was done in 1949, pertained to the concrete on the spillway, flume, and wheel house.

The water level was reportedly lowered in 1950 to facilitate installation of a sewer in the vicinity of the left abutment. Details of the construction, including the elevation of the pipe through the embankment, are unavailable.

- 6.4 Seismic Stability. The dam is located in Seismic Zone No. 2, and in accordance with Corps of Engineers' guidelines does not warrant further seismic analysis at this time.

PIERCE POND DAM

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

- a. Condition. As a result of the visual inspection, the review of available data, and limited information on operation and maintenance, the dam is considered to be in poor condition. The following deficiencies must be corrected to assure the continued performance of this dam: erosion on both slopes of the dam; missing riprap from the upstream slope of the dam; animal burrows on the crest of the dam; spalled concrete and severe leakage through the spillway/flume wall in the vicinity of the low-level outlet and heavy growth of trees on both slopes of the dam.

The slide gate on the low level outlet is submerged and the gate mechanism is inoperable.

The peak test flood (one-half PMF) outflow is estimated to be 2,350 cfs with the pond at El 475.0. The test flood would overtop the low point on the dam by 1.3 feet. Hydraulic analyses indicate that the spillway can discharge 850 cfs or 36 percent of the test flood outflow before the dam is overtopped.

- b. Adequacy. The lack of detailed design and construction data did not allow for a definitive review. Therefore, the evaluation of this dam is based on a review of the available data, the visual inspection, past performance and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within 1 year after receipt of this Phase I Inspection Report.

7.2 Recommendations. It is recommended that the Owner employ a qualified registered engineer to:

- a. Design repairs for the spalled and deteriorated concrete on the spillway/flume side wall. Consideration should be given to designing a new outlet facility.
- b. Develop procedures for clearing brush and trees, and backfilling, from both slopes of the dam, and to a distance of 25 feet from the toe of the dam.

- c. Evaluate the stability of the dam and spillway. This should include an inspection of the spillway under a no flow condition, and an investigation of the embankment after it is cleared of brush and trees. Consideration should be given to lowering the pond level to permit inspection of both sides of the dam.
- d. Perform a detailed hydrologic/hydraulic analysis to evaluate the discharge capability of the spillway and the overtopping potential of the dam.

Upon receipt of this report, and until the recommendations resulting from this investigation are implemented, the Owner should lower the water level in the pond to El. 461, which is the invert of the low-level outlet.

7.3 Remedial Measures

- a. Operating and Maintenance Procedures. It is recommended that the Owner accomplish the following:
 - (1) Repair all spalled and deteriorated concrete on the spillway/flume side wall in accordance with the recommendations of the Engineer.
 - (2) Repair the operating mechanism on the outlet to restore it to working condition.
 - (3) To prevent continued erosion, fill in animal burrows and eroded areas on the upstream and downstream face of the earth embankment, and reseed.
 - (4) Replace missing riprap on the upstream face of the embankment.
 - (5) Remove tree trunks from the discharge channel.
 - (6) Institute a definite plan for surveillance of the dam and spillway during and after periods of heavy rainfall and a plan to warn people in downstream areas in the event of an emergency at the dam.
 - (7) Implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a monthly inspection of the dam and appurtenances and be supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in compliance with all applicable State regulations. The maintenance program should include removal of any debris caught on the spillway weir to prevent clogging of the spillway.

PIERCE POND DAM

(8) Institute a program of technical inspections on an annual basis.

7.4 Alternatives. The alternative to implementing the recommendations and remedial measures listed above would be to drain the pond and remove the dam.

PIERCE POND DAM

APPENDIX A
PERIODIC INSPECTION CHECKLIST

PIERCE POND DAM

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT PIERCE POND

DATE 5/14/80

TIME 9:00 a.m.

WEATHER partly cloudy, 60's

W.S. ELEV. 471.0 U.S. 459.8 D.N.S.

PARTY:

1. S. Pierce (Metcalf & Eddy, Inc. - Geotechnical)
2. S. Nagel (Metcalf & Eddy, Inc. - Geotechnical)
3. W. Checchi (Metcalf & Eddy, Inc. - Geotechnical)
4. W. Diesl (Metcalf & Eddy, Inc. - Geotechnical)
5. L. Branagan (Metcalf & Eddy, Inc. - Hydraulics)

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	<u>Dam</u>	<u>Pierce/Nagel</u>	
2.	<u>Spillway</u>	<u>Branagan/Pierce</u>	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST

PROJECT PIERCE POND

DATE May 14, 1980

PROJECT FEATURE Earth Embankment

NAME S. Pierce

DISCIPLINE Geotechnical

NAME S. Nagel

Note: u/s = upstream; d/s = downstream

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	473.7 to 474.5
Current Pool Elevation	470
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	No pavement; footpath on right bank, grass and moss on left bank
Movement or Settlement of Crest	None visible
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Straight
Condition at Abutment and at Concrete Structures	Left abut.-stone retaining wall & house lot Right abut.-sandy beach and bathhouse Spillway abut.-heavy erosion due to foot traffic
Indications of Movement of Structural Items on Slopes	Chainlink fence adjacent to flume has been dislocated due to erosion of upstream slope, and probable vandalism
Trespassing on Slopes	Many trees up to 20" diam. mostly birch u/s & oak d/s. Tennis court at toe of right bank
Sloughing or Erosion of Slopes or Abutments	*Right bank: heavy erosion u/s and d/s, chiefly due to foot traffic. Left bank: little erosion, slope covered with brush
Rock Slope Protection - Riprap Failures	Small (5') areas of riprap visible below water line, scattered stones appear above water line, but no regular pavement. Riprap silted in or missing.
Unusual Movement or Cracking at or near Toes	u/s - submerged d/s - covered with leaves, brush, and trees
Unusual Embankment or Downstream Seepage	No seepage visible. Area still damp from recent rains. Slope is earth, roots, and leaves, without grass cover
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

*Two animal burrows - 100' and 15' right of spillway.

page A-2 of 7

PERIODIC INSPECTION CHECK LIST

PROJECT PIERCE POND DATE May 14, 1980
 PROJECT FEATURE Intake Flume NAME S. Pierce
 DISCIPLINE Geotechnical NAME S. Nagel

AREA EVALUATED	CONDITION
<u>CUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	Concrete flume leading to control tower. Channel submerged. Vertical concrete sidewalls visible above waterline. Submerged
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	Trash rack, but top is below water line.
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	Vertical concrete sidewalls of flume.
Condition of Concrete	Very poor: several large cracks, one block missing, severe spalling at water line.
Stop Logs and Slots	None

Plaque on wall of wheel house:

Harry L. Pierce
 1911
 Parker, Bateman
 & Chase, Engrs.
 G. Rosse & Son
 Contractors
 Leominster, Mass.

PERIODIC INSPECTION CHECK LIST

PROJECT PIERCE POND DATE May 14, 1980
 PROJECT FEATURE Flume NAME S. Pierce
 DISCIPLINE Geotechnical NAME S. Nagel

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	Concrete flume, parallel sidewalls adjacent to spillway. Leads to low level outlet and wheel house
General Condition of Concrete	Poor to very poor
Rust or Staining on Concrete	Severe, particularly about 3' below water level
Spalling	Severe in vicinity of low-level outlet - can flake off pieces with rod
Erosion or Cavitation	Spalling at water line, both walls. Severe erosion along entire sidewall adjacent to spillway*
Cracking	Several large cracks in cap wall at intake and left wall of flume
Alignment of Monoliths	Apparent settlement of concrete blocks at intake to flume, one block missing.
Alignment of Joints	-
Numbering of Monoliths	-

*Note: Extensive repair work done to concrete in 1949. Second "wall" added to left wall of spillway (right wall of flume) which is now severely eroded and spalled. Severe leakage, wire mesh reinforcement exposed and rusted. See photos NO. 5, 6, 7.

PERIODIC INSPECTION CHECK LIST

PROJECT PIERCE POND DATE May 14, 1980
 PROJECT FEATURE Outlet Channel NAME S. Pierce
 DISCIPLINE Geotechnical NAME S. Nagel

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	Normal discharge through low-level outlet or through blowoff in wheel house-both are blocked. Outlet at turbine not visible- walled up in "new" concrete wall V. poor
General Condition of Concrete	"New" concrete wall added to right wall of flume. See preceeding page.
Rust or Staining	See preceeding page.
Spalling	See preceeding page.
Erosion or Cavitation	See preceeding page.
Visible Reinforcing	See preceeding page.
Any Seepage or Efflorescence	See preceeding page.
Condition at Joints	See preceeding page.
Drain Holes	See preceeding page. Water leaking from end of turbine shaft.
Channel	Discharge into spillway channel.
Loose Rock or Trees Over- hanging Channel	Trees overhanging; dry stone masonry side walls in good condition.
Condition of Discharge Channel	Good- three fallen tree trunks in channel.

PERIODIC INSPECTION CHECK LIST

PROJECT PIERCE POND DATE May 14, 1980
 PROJECT FEATURE Wheel House NAME S. Pierce
 DISCIPLINE Geotechnical NAME S. Nagel

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	Wheel house for turbine which apparently was never used. No operable equipment.
a. Concrete and Structural	
General Condition	Very poor-wood & shingle roof practically gone. No operable devices inside.
Condition of Joints	Fair
Spalling	Severe, particularly at corner foundation wall adj. to spillway channel & flumes outlet.
Visible Reinforcing	Steel rebar visible at "new" concrete wall adjacent to spillway channel
Rusting or Staining of Concrete	Severe - on spillway side of wall.
Any Seepage or Efflorescence	Severe efflorescence-again at spillway channel wall
Joint Alignment	Poor-much patchwork done on walls
Unusual Seepage or Leaks in Gate	Severe leaks through spalled wall of foundation.
Cracks	Hairline fractures throughout
Rusting or Corrosion of Steel	Rebar rusted
b. Mechanical and Electrical	No operable equipment remains-all iron & steel severely rusted
Air Vents	-
Float Wells	-
Crane Hoist	-
Elevator	-
Hydraulic System	-
Service Gates	-
Emergency Gates	-
Lightning Protection System	-
Emergency Power System	-
Wiring and Lighting System in Gate Chamber	None

PERIODIC INSPECTION CHECK LIST

PROJECT PIERCE POND DATE May 14, 1980
 PROJECT FEATURE Spillway NAME S. Pierce
 DISCIPLINE Geotechnical NAME S. Nagel

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	Concrete and stone semi ogee weir- concrete apron and stone-masonry d/s slope in two steps.
a. Approach Channel	Submerged
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Submerged-no riprap or apron visible
b. Weir and Training Walls	Weir covered with water - can't inspect
General Condition of Concrete	Poor
Rust or Staining	Minor, below water line
Spalling	Severe at water line, both walls aggregate exposed.
Any Visible Reinforcing	None on spillway, see description of left sidewall, page A-4
Any Seepage or Efflorescence	Minor efflorescence
Drain Holes	None on spillway; two visible on side walls of discharge channel
c. Discharge Channel	Vertical dry stone masonry side walls, end at concrete abutments of Lindell Avenue bridge.
General Condition	Good-walls intact, minor evidence of seepage at base of both walls.
Loose Rock Overhanging Channel	None. One stone block has fallen into channel from Lindell Ave. bridge.
Trees Overhanging Channel	Many bushes, several small trees
Floor of Channel	Natural stream bottom - boulders
Other Obstructions	None

APPENDIX B
PLANS OF DAM AND PREVIOUS
INSPECTION REPORTS

	<u>Page</u>
Figure B-1, Plan of Dam and sections	B-1
Figure B-2, Plan of Dam, approved April 7, 1911, traced February 6, 1940	B-2
File card for Pierce Pond Dam from Worcester County Engineer's Office	B-3
Previous Inspection Reports Dated 1924 through 1969 by Worcester County Engineering	B-4

PIERCE POND DAM

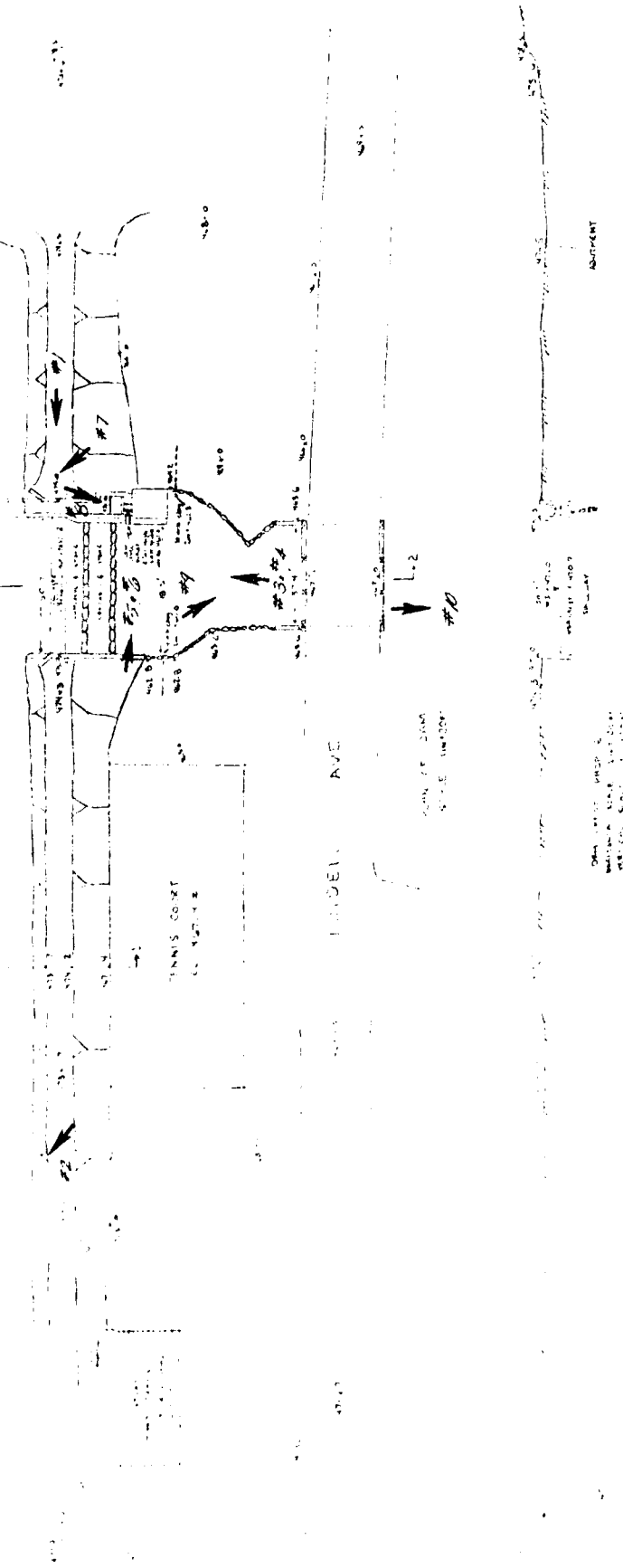
NOTES:

1. Elevations shown are based on spillway weir crest elevation 472.33 (City of Leominster Datum), as shown on 1950 sewer Plan and Profile of Upper Meridian Ave. Trunk Sewer. An adjustment of minus (-) 1.62' yields the National Geodetic Vertical Datum of 1929 (NGVD) and subsequent weir crest elevation of 470.71 (NGVD).
2. Information shown based on field inspection of 14 May 1960.
3. #2 indicates location and direction of view for photograph.

PIERCE POND

WATER SURFACE ELEVATION 471.0

1-2



NOTE:
PLAN REDUCED
FOR THIS REASON

PROJECT NO.	100-100000-100
DATE	10/1/60
BY	J. H. B. / J. H. B.
CHECKED BY	J. H. B. / J. H. B.
APPROVED BY	J. H. B. / J. H. B.
PIERCE POND DAM	
FILE NO. 100-100000-100	

COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

ected by L.D. Gardner Date Oct. 9, 1948 Dam No. 26-11

m Leominster Location Monooksnoe Brook

er Peter T. Hoche Use

terial and Type

n Designed by Constructed by Year

SPILLWAY

top Abutment El. Crest El. Apron El. Streambed

th top Abutment Width top Crest Width bottom Spillway

th Flashboards carried Kind Flashboards

Flowline Cleanout Pipe Size and Kind Cleanout Pipe

d of Foundation under Spillway

dition concrete in spillway and gate section is badly cracked at
joints in walls surface of walls is spalling off. remove poor concrete
and resurface same. spillway section should be lengthened.

BANKMENT

Top El. Natural Ground Width Top

th of Bottom Upstream Slope Downstream Slope

id of Corewall Riprap

terial in Embankment Foundation

dition grubb brown out of embankment and fill holes

TES Location

Kind El. Flowline

dition fair

HEEL Kind Size Rated H. P.

ation Ave. Head

dence of Leaks in Structure seepage along foot of embankment

ent Repairs and Date

ography of Country below Dam

ure of Buildings and Roads below Dam

umber Acres in Pond Drainage Area in Square Miles

charge in Second Feet per Square Mile

imated Storage Million Cubic Feet

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by *E. C. Corcoran* Date *Dec. 9 1942* Dam No. *26-11*

Town *Leominster* Location

Owner Use

Material and Type *Spillway inadequate to handle 1938
Flood Waters - Pom.*

Dam Designed by Constructed by Year

SPILLWAY

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition *Good - Except for disintegration of concrete in places in
abutment walls*

EMBANKMENT

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition *Good - Brush should be cut from slopes
No leaks showing at time of inspection*

GATES *closed* Location

Size Kind El. Flowline

Condition *Fairly good Places in concrete around gate disintegrating*

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

WORCESTER COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by E. C. Corcoran Date 2-27-39 Dam No. 28-11
.....

Town Leominster Location _____
Owner _____ Use _____

SPILLWAY

Took Measurements.

El. top Abutment _____ El. Crest _____ El. Apron _____ El. St. Bed _____
Width top Abut. _____ Width top Crest _____ Width bottom Sp. way _____
Width flashboards _____ Kind Flashboards _____
El. Flowline Cleanout Pipe _____ Size and Kind Pipe _____
Kind of Foundation under Spillway _____
Condition _____

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____
Width of Bottom _____ Upstream Slope _____ Downstream Slope _____
Kind of Corewall _____ Riprap _____
Material in Embankment _____ Foundation _____
Condition _____

GATES

_____ Location _____
Size _____ Kind _____ El. Flowline _____
Condition _____

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____
Discharge in Second Feet per Square Mile _____
Estimated Storage Million Cubic Feet _____

WORCESTER COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by E C Concoran Date Jan. 6, 1939 Dam No. 26-11

Town LEOMINSTER Location 1

Owner Raccoon Pond Use _____

SPILLWAY

1.45 PM Water 4" over spillway
(Approx) Measurement taken from Bridge Floor

El. top Abutment _____ El. Crest _____ El. Apron _____ El. St. Bed _____

Width top Abut. _____ Width top Crest _____ Width bottom Sp. way _____

Width flashboards _____ Kind Flashboards _____

El. Flowline Cleanout Pipe _____ Size and Kind Pipe _____

Kind of Foundation under Spillway _____

Condition Good

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____

Width of Bottom _____ Upstream Slope _____ Downstream Slope _____

Kind of Corewall _____ Riprap _____

Material in Embankment _____ Foundation _____

Condition _____

GATES

Location _____

Size _____ Kind _____ El. Flowline _____

Condition _____

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____

**COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER**

Inspection of Dams, Reservoir Dams, and Reservoirs.

U.S. Forestry Engineer-Guy Classon

Inspected by L.O. Marden-W. Shaw Date 12-5-1938 Dam No. 26-11

Town Leominster Location Roches Pond.

Owner Roche Use _____

Material and Type recommend place log boom across to inlets distant from spillway.

Dam Designed by _____ Constructed by _____ Year _____

SPILLWAY

El. top Abutment _____ El. Crest _____ El. Apron _____ El. Streambed _____

Width top Abutment _____ Width top Crest _____ Width bottom Spillway _____

Width Flashboards carried _____ Kind Flashboards _____

El. Flowline Cleanout Pipe _____ Size and Kind Cleanout Pipe _____

Kind of Foundation under Spillway _____

Condition inadequate to handle flood waters, accept water goes across road to Fitchburg at low place.

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____

Width of Bottom _____ Upstream Slope _____ Downstream Slope _____

Kind of Corewall _____ Riprap _____

Material in Embankment _____ Foundation _____

Condition _____

GATES _____ Location _____

Size _____ Kind _____ El. Flowline _____

Condition _____

WHEEL _____ Kind _____ Size _____ Rated H. P. _____

Location _____ Ave. Head _____

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Topography of Country below Dam _____

Nature of Buildings and Roads below Dam _____

Number Acres in Pond _____ Drainage Area in Square Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____

Note: See L.O. # Report Dec. 7, 1932

WORCESTER COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs

Inspected by B. P. St. John Date 10-10-38 Dam No. 26-11
.....

Town Leominster Location _____

Owner William E. Holman Use _____

conc. and stone Earth

SPILLWAY H. W. not over dam

El. top Abutment 100 El. Crest 3.0' El. Apron _____ El. St. Bed _____

Width top Abut. 1 1/2' Width top Crest _____ Width bottom Sp. way _____

Width flashboards none Kind Flashboards _____

El. Flowline Cleanout Pipe _____ Size and Kind Pipe _____

Kind of Foundation under Spillway _____

Condition good

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____

Width of Bottom _____ Upstream Slope _____ Downstream Slope _____

Kind of Corewall _____ Riprap _____

Material in Embankment _____ Foundation _____

Condition good

GATES

Location _____

Size _____ Kind _____ El. Flowline _____

Condition good

Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Number Acres in Pond _____ Drainage Area in Sq. Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____

COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by L.O.M.; W.E. Holman; W'm Potter Date April 27, 1933 Dam No. 88-11

Town Leominster Location _____
Owner W.E. Holman Use _____
Material and Type _____

Dam Designed by _____ Constructed by _____ Year _____

SPILLWAY

El. top Abutment _____ El. Crest _____ El. Apron _____ El. Streambed _____
Width top Abutment _____ Width top Crest _____ Width bottom Spillway _____
Width Flashboards carried _____ Kind Flashboards _____
El. Flowline Cleanout Pipe _____ Size and Kind Cleanout Pipe _____
Kind of Foundation under Spillway _____
Condition Discuss condition of concrete

EMBANKMENT

El. Top _____ El. Natural Ground _____ Width Top _____
Width of Bottom _____ Upstream Slope _____ Downstream Slope _____
Kind of Corewall _____ Riprap _____
Material in Embankment _____ Foundation _____
Condition Discuss removal trees and brush spillway section.

GATES

Location _____
Size _____ Kind _____ El. Flowline _____
Condition _____

WHEEL

Kind _____ Size _____ Rated H. P. _____
Location _____ Ave. Head _____
Evidence of Leaks in Structure _____

Recent Repairs and Date _____

Topography of Country below Dam _____

Nature of Buildings and Roads below Dam _____

Number Acres in Pond _____ Drainage Area in Square Miles _____

Discharge in Second Feet per Square Mile _____

Estimated Storage Million Cubic Feet _____

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by L. O. Marden Date Dec. 7, 1932 Dam No. 26-11

Town Leominster Location

Owner William E. Holman. Use Storage.

Material and Type

Dam Designed by Constructed by Year

SPILLWAY—Length Feet Depth Feet

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition Cracks in concrete. Should have old concrete cut out, and new concrete placed, preferably under pressure.

EMBANKMENT—Length overall Feet

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition Brush and trees should be cut, and roots grubbed out of embankment.

GATES Location

Size Kind El. Flowline

Condition Concrete around gates where disintegrating. Should be renewed as above.

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure Small amount of seepage.

Recent Repairs and Date None.

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number of Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by L.O. Marden Date 1-28-1932 Dam No. 26-11

Town Leominster Location

Owner Use

Material and Type

Dam Designed by Constructed by Year

SPILLWAY—Length Feet. Depth Feet

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition concrete sides part disintegrating- not dangerous at present

EMBANKMENT—Length overall Feet

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition good- should cut off brush off slopes

GATES Location

Size Kind El. Flowline

Condition OK- except stem at wheel rotted.

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure seepage at east end embankment-no more than previ inspection.

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number of Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by.....L.O.Marden..... Date Dec.10, 1928 Dam No. 26-11

Town Leominster Location.....

Owner Mayor Bernard L. Doyle Use.....

Material and Type.....

Dam Designed by Parker Bateman & Chase Constructed by C. Roase & Son Year 1911.

SPILLWAY

El. top Abutment..... El. Crest..... El. Apron..... El. Streambed.....

Width top Abutment..... Width top Crest..... Width bottom Spillway.....

Width Flashboards carried..... Kind Flashboards.....

El. Flowline Cleanout Pipe..... Size and Kind Cleanout Pipe.....

Kind of Foundation under Spillway.....

Condition..... poor concrete - -should be resurfaced in several places.

EMBANKMENT

El. Top..... El. Natural Ground..... Width Top.....

Width of Bottom..... Upstream Slope..... Downstream Slope.....

Kind of Corewall..... Riprap.....

Material in Embankment..... Foundation.....

Condition..... cut off all trees and brush on top and slopes- leaks along toe
embankment - should investigate see if can stop- or keep pond part down.

GATES..... Location.....

Size..... Kind..... El. Flowline.....

Condition..... appears ok.

WHEEL..... Kind..... Size..... Rated H. P.....

Location..... Ave. Head.....

Evidence of Leaks in Structure..... see embankment.

Recent Repairs and Date.....

Topography of Country below Dam.....

Nature of Buildings and Roads below Dam.....

Number Acres in Pond..... Drainage Area in Square Miles.....

Discharge in Second Feet per Square Mile.....

Estimated Storage Million Cubic Feet.....

Dam No. _____

Dam No. 26-11

**COUNTY OF WORCESTER, MASSACHUSETTS
OFFICE OF COUNTY ENGINEER**

SECOND INSPECTION

Neg. Nos. _____

INSPECTION OF DAMS, RESERVOIR DAMS AND RESERVOIRS

Town Leominster ✓ Date Dec. 14, 1926 ✓ Dam No. 26-11 ✓

Location _____ Name of Pond or Stream _____

Inspected by L.O. Warden ✓

Owner H.L. Pierce ✓

Use Storage ✓

MATERIAL & TYPE See first inspection sheet ✓

Elevations in feet: above (+) or below (-) full pond or reservoir level.

FOR DAM Bed of stream below _____ top of spillway _____

FOR RESERVOIR

top of dam _____ top of flashboards _____ ground surface below _____

_____ level of overflow pipe _____ length in feet _____

width top in feet _____ width bottom in feet _____ size pipe to mill _____

_____ inches _____ length spillway in feet _____ head in feet _____

Size of wheel _____ H. P. developed _____

Size of gates _____ location of gates _____

Foundation and details of construction _____

_____ condition of embankment cut brush ✓

Constructed by _____ date _____

Designed by _____ location _____

Recent repairs and date _____

Evidence of leakage _____

Condition _____

Topography of country below _____

Nature of buildings and roads below dam _____

No. Acres in watershed _____ No. Acres in pond _____

Plans secured _____ Percent watershed in cultivation _____

Percent in forests _____ Note: Cross out word not applicable _____

COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by L. O. Marden Date Nov. 14, 1924 Dam No. 26-11

Town Leominster Location Below dam "a" Fitchburg Maple Ave.

Owner Pinecroft Riding School Use Storage

Material and Type Earth-- masonry- and concrete spillway to gates

Dam Designed by Parker Bateman Chase Constructed by G. Rosse Son Year 1911
Leominster

SPILLWAY LENGTH 54 50

El. top Abutment 100 El. Crest 97 El. Apron El. Streambed 85

Width top Abutment 12 Width top Crest 12 Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition

EMBANKMENT LENGTH 500

El. Top 100 El. Natural Ground 85 Width Top 12

Width of Bottom Upstream Slope 1 1/2:1 Downstream Slope 1 1/2:1

Kind of Corewall Riprap

Material in Embankment Foundation

Condition

GATES Location

Size Kind El. Flowline

Condition

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure none

Recent Repairs and Date none

Topography of Country below Dam open

Nature of Buildings and Roads below Dam none immediatly below

Number Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

TOWN OR CITY **Leamington**DECREE NO. **100**DAM NO. **26**LOCATION **Manasnoc Brook - Lindell Ave. near Marriam Ave.** C. C. DOCKET NO.

DESCRIPTION OF DAM

El. 100.

Type **Earthen Dam - Conc. Core Wall**
 Length **240.**
 Height **13.**
 Thickness top **10**
 " bottom **70.**
 Downstream Slope **2:1**
 Upstream " **2:1**
 Length of Spillway **El. 97.0 Depth = 3.0**
 Size of Gates **4' x 8' 0"**
 Location of Gates **Right of Spillway**
 Flashboards used
 Width Flashboards or Gates
 Dam designed by **Parker, Bateman & Chase, C.E.**
 " constructed by **G. Rosset Son**
 Year constructed **1911**

DESCRIPTION OF RESERVOIR & WATERSHED

Name of Main Stream **Manasnoc Brook**
 " " any other Streams
 Length of Watershed **269** } **M. - Mar. 1911**
 Width " " } **P. - April 3, 1911**
 Is Watershed Cultivated
 Percent in Forests
 Steepness of Slope
 Kind of Soil
 No. of Acres in Watershed
 " " " " Reservoir **7.29 sq. M**
 Length of Reservoir
 Width "
 Max Flow Cu. Ft. per Sec.
 Head or Flashboards - Low Water
 " " " " High

GENERAL REMARKS

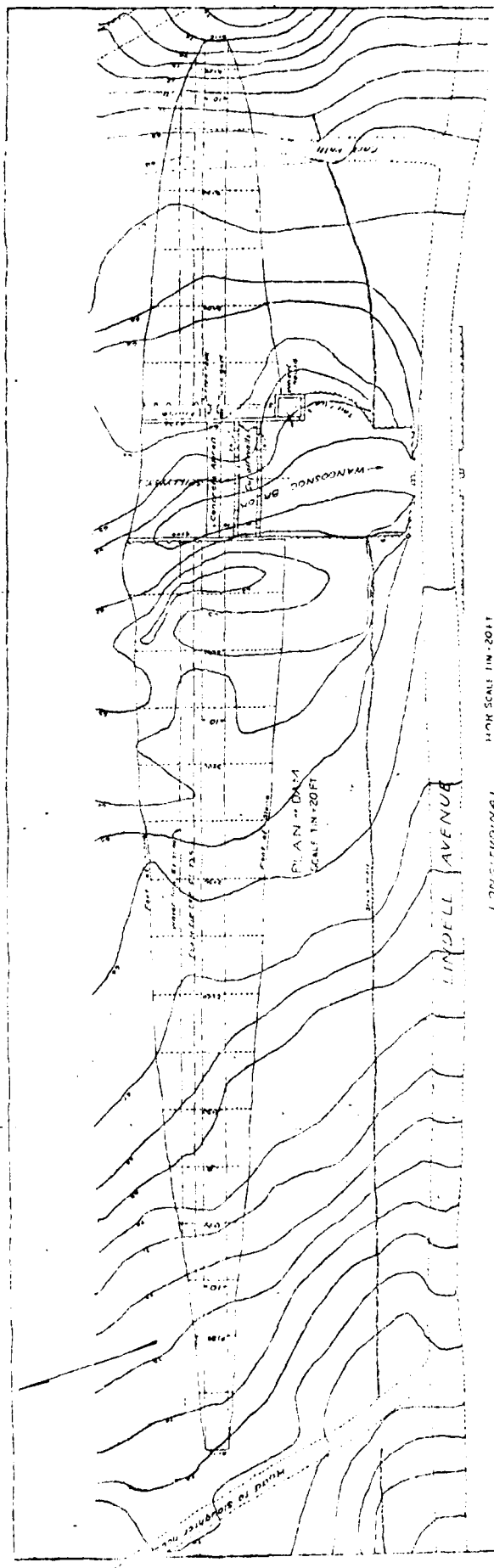
1955 M.D.C.

Owned by **H. L. Pierce - Mary Lohrman**
C. C. Records vol. 31 - P. 6 - April 7, 1911
(Plans are filed)
 Owned now by **Bernard L. Doyle**
C. Pincroft Riding School
 Inspected: **Nov. 14, 1924 - L. O. Marden**
Dec. 14, 1926 - "
Dec. 10, 1928 - "
Jan. 28, 1932 - "
1939 Owned by E. C. Carcoran

GENERAL REMARKS

Owned 1932 by **Wm. F. Holman**
 Inspected: **Dec. 7, 1932 - L. O. M. - G. Carson**
" April 27, 1933 - E. Holman - B. P. St. John
" Oct. 10, 1938 - B. P. St. John
" Dec. 5, 1938 - L. O. M., Shaw, Carson
" Jan. 6, 1939 - E. C. Carcoran
 Measured: **Mar. 23, 1939**
(Field Book 106 - P. 5)
 Record C. C. Carcoran: **P. 6 - Tr. Checked by F. E. P. 104 - 37-40**
DIRE

Inspected: **12/9/42 - E. C. Carcoran**Oct. 9, 1943 - **L. O. Marden**Jan. 2, 1944 - **E. C. Carcoran**Dec. 8, 1945 - **E. C. Carcoran**June 30, 1948 - **L. O. M**June 27, 1949 - **"**March 26, 1951 - **"**Survey May 9, 1949 **LHS, RNB, LNS, (BL 10 - P. 79)****26-11**



HIGH SCALE IN 20 FT
LOW SCALE IN 10 FT

LONGITUDINAL
SECTION

SECTION - DAM
SCALE IN 20 FT

SECTION - DAM
SCALE IN 20 FT

SECTION - DAM
SCALE IN 20 FT

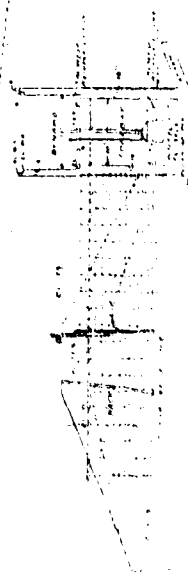
SECTION - DAM
SCALE IN 20 FT

NOTE:
PLAN REDUCED
FOR THIS REPORT

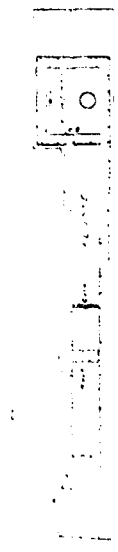
WORCESTER COUNTY COMMISSIONERS
FOR THE
COUNTY ENGINEERING DEPARTMENT

MASSACHUSETTS
LEONARD M. WOOD
FOR HARRIS PIERCE
AS FILED AND APPROVED BY THE
COUNTY COMMISSIONERS
DOCKET NO. 4673
SCALE AS NOTED

MADE BY
DATE NO. 26.11
1911



SECTION - DAM
SCALE IN 20 FT



SECTION - DAM
SCALE IN 20 FT



SECTION - DAM
SCALE IN 20 FT

COUNTY OF WORCESTER MASSACHUSETTS

COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by E. C. Cioran Date 1/6/44 Dam No. 26-11

Town Leominster Location
Owner Roache Use
Material and Type Stone & Concrete

Dam Designed by Constructed by Year

SPILLWAY

El. top Abutment El. Crest El. Apron El. Streambed
Width top Abutment Width top Crest Width bottom Spillway
Width Flashboards carried Kind Flashboards
El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe
Kind of Foundation under Spillway
Condition Good Abutment walls and center pier
show signs of deterioration

EMBANKMENT

El. Top El. Natural Ground Width Top
Width of Bottom Upstream Slope Downstream Slope
Kind of Corewall Riprap
Material in Embankment Foundation
Condition Good
Trees and shrub growing
GATES Closed Location
Size Kind El. Flowline
Condition

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

COUNTY OF WORCESTER MASSACHUSETTS
COUNTY ENGINEER

Inspection of Dams, Reservoir Dams, and Reservoirs.

Inspected by C. S. C. O. S. T. A. N. Date 12/11/45 Dam No. 26-11

Town LEDMINSTER Location

Owner Use

Material and Type

DEC 12 1945

Dam Designed by Constructed by Year

WORCESTER COUNTY
ENGINEERING DEPT.

SPILLWAY

El. top Abutment El. Crest El. Apron El. Streambed

Width top Abutment Width top Crest Width bottom Spillway

Width Flashboards carried Kind Flashboards

El. Flowline Cleanout Pipe Size and Kind Cleanout Pipe

Kind of Foundation under Spillway

Condition Abt. walls and center pier are deteriorating in places
small amount of water over spillway

EMBANKMENT

El. Top El. Natural Ground Width Top

Width of Bottom Upstream Slope Downstream Slope

Kind of Corewall Riprap

Material in Embankment Foundation

Condition O. K. (Brush and trees on Embankment)

GATES Location

Size Kind El. Flowline

Condition

WHEEL Kind Size Rated H. P.

Location Ave. Head

Evidence of Leaks in Structure

Recent Repairs and Date

Topography of Country below Dam

Nature of Buildings and Roads below Dam

Number Acres in Pond Drainage Area in Square Miles

Discharge in Second Feet per Square Mile

Estimated Storage Million Cubic Feet

TOWN Leominster

LOCATION Lindell Ave.

THIS DAM
NEEDS ATTENTION

DAM NO. 26-11

STREAM Monooksnot

WORCESTER COUNTY ENGINEERING DEPARTMENT

WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Peter T. Roche PLACE Leominster USE storage

INSPECTED BY L.O. Marden DATE 1946

TYPE OF DAM earth-concrete CONDITION poor

SPILLWAY

FLASHBOARDS IN PLACE none RECENT REPAIRS none

CONDITION concrete in wasteway and gate section badly spalled and cracked at wall joints. Should be repaired.

REPAIRS NEEDED Cut out poor concrete and resurface by pneumatic process.

EMBANKMENT

RECENT REPAIRS none

CONDITION should grub out roots of all trees and brush

REPAIRS NEEDED " " " " " " " " fill any holes

GATES

RECENT REPAIRS none

CONDITION check condition

REPAIRS NEEDED place in good condition.

LEAKS

HOW SERIOUS some seepage. Spillway section should be enlarged as 1938 flood just missed going over embankment.

DATE Feb. 9, 1948

L. O. Marden
COUNTY ENGINEER

TOWN Leominster
LOCATION Pierce Pond

DAM NO. 26-4
STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Peter T. Roche PLACE Leominster USE _____
INSPECTED BY L O Marlin DATE June 28, 1948
TYPE OF DAM Earth CONDITION Poor

SPILLWAY

FLASHBOARDS IN PLACE None RECENT REPAIRS None
CONDITION Concrete cracked & spalled at
REPAIRS NEEDED Reface concrete - lower spillway crest
1-6"

EMBANKMENT

RECENT REPAIRS None
CONDITION Should take off trees & brush
REPAIRS NEEDED After trees & brush removed - reseed.

GATES

RECENT REPAIRS _____
CONDITION _____
REPAIRS NEEDED Reface with concrete - new track
rack

LEAKS

HOW SERIOUS Along downstream slope

DATE _____

COUNTY ENGINEER

TOWN Leominster

DAM NO. 26-11

LOCATION Pierce Pond

STREAM Monoosnoc R

WORCESTER COUNTY ENGINEERING DEPARTMENT

WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Mary Cohn PLACE Leominster USE storage

INSPECTED BY L.O. Marden-I. Hiltz DATE Several times during reconstruction

April 22-25-29-May 11-14-19 June 1; June 27-
TYPE OF DAM Earth embankment-stone & Conc. Spill CONDITION poor

SPILLWAY

FLASHBOARDS IN PLACE none RECENT REPAIRS yes

CONDITION foot bridge poor shape-sunk down-concrete poor-

REPAIRS NEEDED Remove bridge-remove pier-rebuild crest of spillway-

Raise top of abutments to top embankment. Recommended that crest be cut
down two feet, and flashboards used- This was not done-after consultati

EMBANKMENT with County Commissioners by owner of summer school and
Master Mechanic Irving Hiltz of Great Am. Plastics Fitchb.

RECENT REPAIRS none

CONDITION leaks along downstream side when pond full

REPAIRS NEEDED Should cut out trees and any brush- check for leaks.

GATES

RECENT REPAIRS Yes, Refaced outside and inside of concrete walls to flu
with new concrete- Repaired gate, but not as directed- Removed old

CONDITION trash rack and replaced with new one. Sealed up old flume exit

REPAIRS NEEDED see above

LEAKS

HOW SERIOUS _____

DATE [1949?]

COUNTY ENGINEER

TOWN Leominster
LOCATION Pierce Pond

DAM NO. 26-11
STREAM Abnash River

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Mary Cohn PLACE Leominster USE pleasure
INSPECTED BY L.M. DATE 1-15-58
1-16-58
3-18-58
TYPE OF DAM Earth CONDITION

SPILLWAY

FLASHBOARDS IN PLACE
CONDITION H2O over crest.
REPAIRS NEEDED
Call Mrs. Cohn & tell her to lower 12"

EMBANKMENT

RECENT REPAIRS
CONDITION
REPAIRS NEEDED

GATES

RECENT REPAIRS
CONDITION
REPAIRS NEEDED

LEAKS

HOW SERIOUS

DATE

COUNTY ENGINEER

TOWN Leominster
LOCATION Pierce Pond

DAM NO. 26-11
STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Mary Cahn PLACE Leominster USE Storage
INSPECTED BY LOM DATE Oct. 31, 1950
TYPE OF DAM Earth. Conc. Spillway CONDITION _____

SPILLWAY

FLASHBOARDS IN PLACE None RECENT REPAIRS Yes
CONDITION Good
REPAIRS NEEDED None, except not lowered 2' as requested by Co. Eng.

EMBANKMENT

RECENT REPAIRS None
CONDITION Crown with trees & brush
REPAIRS NEEDED Cut off

GATES

RECENT REPAIRS Yes
CONDITION Good
REPAIRS NEEDED None

LEAKS

HOW SERIOUS At downstream side embankment

DATE Oct. 31, 1950

L. O. Marden
COUNTY ENGINEER

TOWN Leominster

DAM NO. 26-11

LOCATION Pierce Pond

STREAM Monodocumoc

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Mary Cohn PLACE Leominster USE none

INSPECTED BY LOM DATE 3-26-51

TYPE OF DAM _____ CONDITION Good

SPILLWAY

FLASHBOARDS IN PLACE none RECENT REPAIRS _____

CONDITION spillway, but not deepened according to past report
from L.O. Marden to Co. Com. Owner of land saw Jones-
REPAIRS NEEDED Should deepen two feet.

EMBANKMENT

RECENT REPAIRS none

CONDITION slope needs flattening on down stream side.

REPAIRS NEEDED cut off brush and trees grub out roots.

reshape embankment.

GATES

RECENT REPAIRS yes

CONDITION good

REPAIRS NEEDED none

LEAKS

HOW SERIOUS minor

DATE _____

COUNTY ENGINEER

TOWN Leominster

DAM NO. 26-11

LOCATION _____

STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Mary Cohn PLACE Leominster USE _____

INSPECTED BY LH Spafford DATE 10/22/54

TYPE OF DAM _____ CONDITION _____

SPILLWAY

FLASHBOARDS IN PLACE None RECENT REPAIRS _____

CONDITION Fair

REPAIRS NEEDED _____

EMBANKMENT

RECENT REPAIRS _____

CONDITION Fair - needs brush cutting

REPAIRS NEEDED _____

GATES

RECENT REPAIRS _____

CONDITION Bad - appear to be inoperating

REPAIRS NEEDED _____

LEAKS

HOW SERIOUS _____

DATE _____

COUNTY ENGINEER

TOWN Leominster

DAM NO. 26-11

LOCATION _____

STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT

WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

OWNED BY Mary Lahn PLACE Leominster USE _____

INSPECTED BY Lan DATE 1956

TYPE OF DAM _____ CONDITION _____

SPILLWAY

FLASHBOARDS IN PLACE _____ RECENT REPAIRS _____

CONDITION None

REPAIRS NEEDED _____

EMBANKMENT

RECENT REPAIRS _____

CONDITION Fair to good

REPAIRS NEEDED _____

GATES

RECENT REPAIRS _____

CONDITION " " "

REPAIRS NEEDED _____

LEAKS

HOW SERIOUS _____

DATE _____

L.O. Heardon
COUNTY ENGINEER

TOWN Leominster DAM NO. 26-11
LOCATION On Lindell St. STREAM Muncasnoc Brook

"Pierce Pond"
WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Inspected by 1946 Fitchburg Realty Corp. Place Fitchburg Use old storage pond.
Inspected by WOL. Date Oct. 8, 1964
Type of Dam Earth, stone and concrete Condition Fair

SPILLWAY

Spillway Boards in Place No boards Recent Repairs _____
Condition Good condition. The water level is 0.5' below the spillway
Repairs Needed crack The crack is beginning to spill in 2 places
Some repairs were made to this dam in 1949.

BANKMENT

Recent Repairs _____
Condition The embankment is covered with trees and brush.
Repairs Needed _____

WHEEL

Recent Repairs The water wheel located in the concrete bldg below the spillway
Condition is abandoned. The penstock gate has been blocked off.
Repairs Needed The flood gate, with a 3' x 3' stone box outlet, is inoperable. Double
wood stems, with a vertical wheel. All timbers should be renewed - the wheel is missing.

REMARKS

Serious There is a leak at the easterly end of the spillway.

Engineer: _____ County Engineer

Dam near Lindell Ave

IN Leominster DAM NO. 26-11
LOCATION near Lindell Ave STREAM _____

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

D A M I N S P E C T I O N R E P O R T

Designed by _____ Place _____ Use _____
Inspected by T.C.M. - H.B.P. Date 3-10-69
Name of Dam _____ Condition _____

SPILLWAY

Trashboards in Place none Recent Repairs _____
Condition about 2 Tenths of water over spillway
Repairs Needed _____

BANKMENT

Recent Repairs _____
Condition _____
Repairs Needed _____

PIERS - closed

Recent Repairs _____
Condition _____
Repairs Needed _____

Re-checked 3-1A-69

REMARKS

Is Serious _____

By: _____ County Engineer

APPENDIX C

PHOTOGRAPHS

Note: Location and direction of photographs shown on
Figure B-1 in Appendix B.

PIERCE POND DAM



NO. 2 EROSION AND TREE GROWTH ON
UPSTREAM SLOPE OF DAM.



NO. 1 TOP OF DAM, FROM SPILLWAY TO
RIGHT (WEST) ABUTMENT.



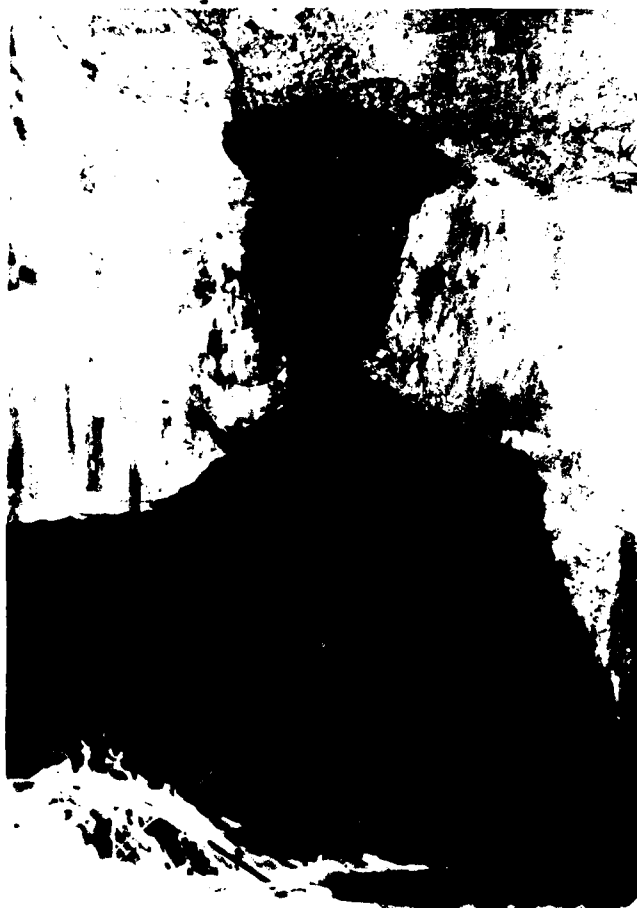
**NO. 3 SPILLWAY APRON AND DISCHARGE CHANNEL
(FEBRUARY 1980).**



**NO. 4 SPILLWAY AND LEFT SIDEWALL, ADJACENT TO
FLUME AND WHEEL HOUSE (MAY 1980).**



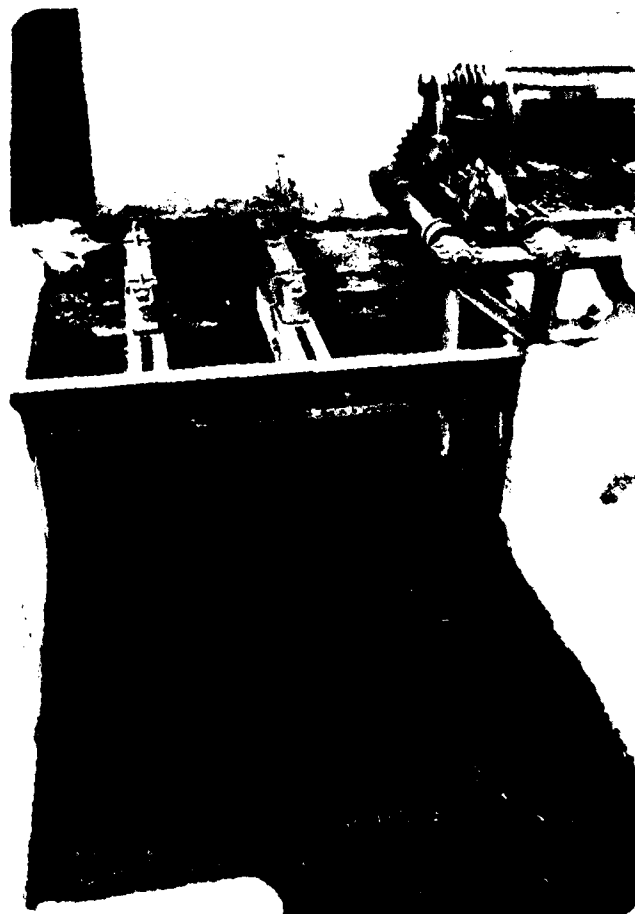
**NO. 5 FLUME AND WHEEL HOUSE. NOTE GATE MECHANISM
ON TOP OF WALL.**



**NO. 6 SEVERE EROSION AND SPALLING
AT LOW LEVEL OUTLET.**



NO. 7 INTAKE CHANNEL TO FLUME.



NO. 8 SLIDE GATE MECHANISM FOR LOW
LEVEL OUTLET.



**NO. 9 SPILLWAY DISCHARGE CHANNEL AND LINDELL
 AVENUE BRIDGE.**



**NO. 10 MONOOSNOC BROOK DOWNSTREAM OF LINDELL
 AVENUE.**

APPENDIX D
HYDROLOGIC AND HYDRAULIC
COMPUTATIONS

	<u>Page</u>
Figure D-1, Drainage Area Map	D-1
Hydrologic and Hydraulic Computations	D-2

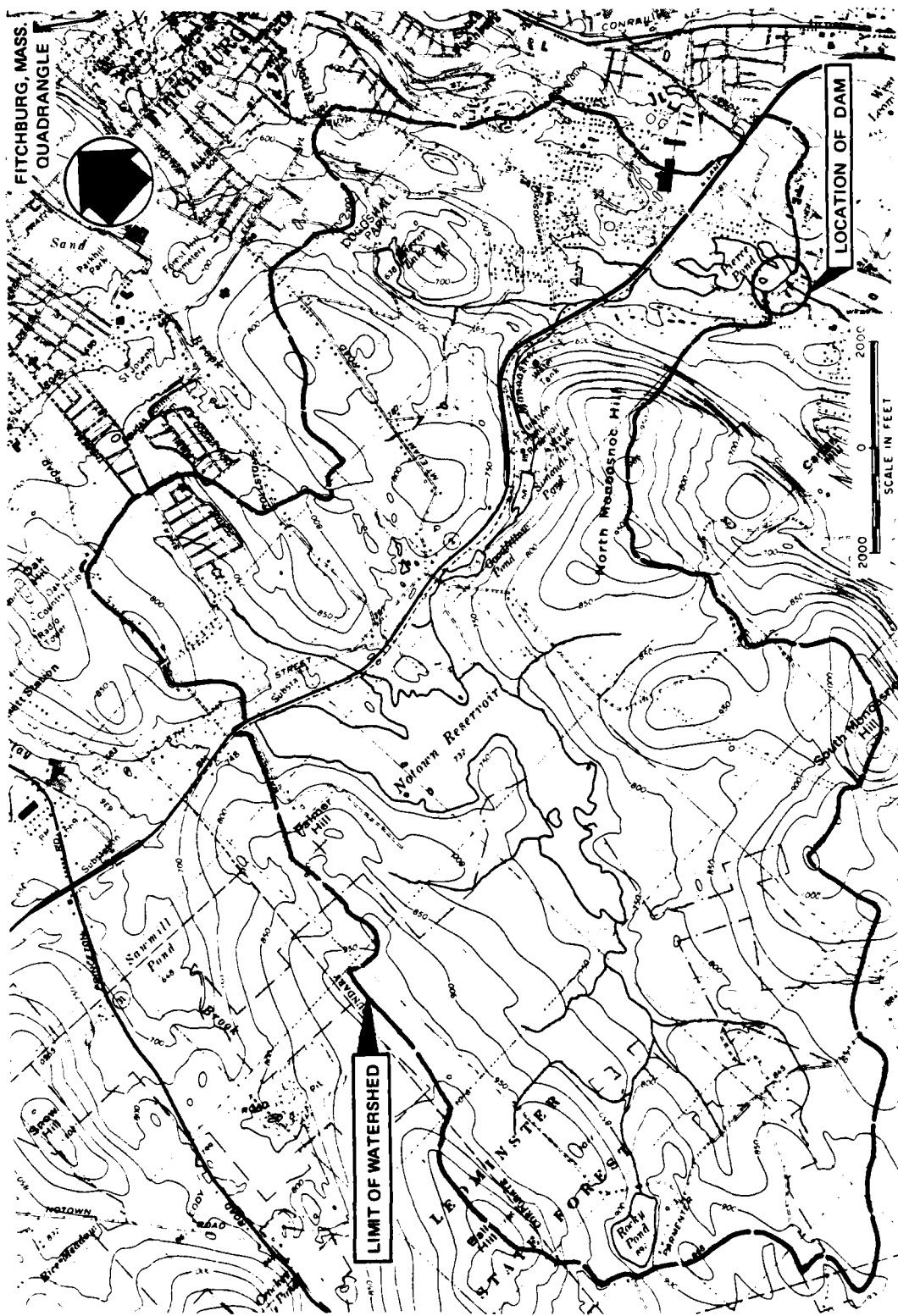


FIG. D-1 DRAINAGE AREA MAP

PIERCE POND DAM

Project Nat. Review of Non-Federal Dams
Subject Worcester County, Mass
Detail PIERCE POND

Acct. No. 6926

Comptd. By LEB

Ckd. By Mauri Hazard

Page 1 of 4

Date 5/30/80

Date 6/5/80

FORWARD

Pierce Pond has a 7.23 mi² drainage area. Drainage from 4.7 mi² of this area passes through the very large Notown Res. The U.S. C.of E. has issued a report titled "Hydrologic Analysis for Monoosnoc Brook Flood Control" which deals in detail regarding the hydrology of a diversion scheme at Rockwell Pond, which has a drainage area of 10.4 mi² and is downstream of Pierce Pond.

The C.of E. report provides hydrographs for discharge from Notown Res. and inflow to Rockwell Pond from its drainage area below Notown, based on a Standard Project Flood.

Pierce Pond has a "SMALL" dam, but is a "HIGH" hazard. Based on C.of E. criteria, the "TEST FLOOD" used is based on a "1/2 PMF". Since this is the same as the C.of E. Std. Proj. Flood, peak values from the C.of E. report can be used without adjustment.

I Using the C.of E. Report:

A - The 5.7 mi² below Notown Res produces a peak inflow to Rockwell Pd. of 3500 cfs. - or 614 csm. Using the C.of E. Max. Prob. Flood - Peak Flow Rate curves as a guide, the 2.53 mi² between Notown & Pierce Pond would have a comparable peak inflow of 720 csm or 1820 cfs. The U.S.G.S map for the area suggests that the drainage area below Notown Res. and above either Pierce Pd. or Rockwell Pd. are hydrologically similar.

B - Peak outflow from Notown Res. is 1400 cfs. At Rockwell Pd. the Notown peak arrives 8 hours after the local inflow. A review of the topography indicates that the Notown peak should arrive at Pierce Pond in about half the time, or 4 hrs after the local peak. The "time to peak" is about 11 hours for the Notown outflow at Rockwell Pd. Assume this is ± 8 hours at Pierce Pond.

C - Total peak inflow at Pierce Pd.

$$1 - \text{Peak Inflow} = (\text{Local Peak}) + \frac{4}{8} (\text{Notown Peak}) = 2520 \text{ cfs}$$

$$2 - \text{S.P.F. rain} = 8.6" \therefore F_{TF} = 2520 - \frac{1820}{8.6} S = 2520 - 211.6 S$$

$$3 - \text{Local drainage area} = 2.53 \text{ mi}^2, \text{ Area of Pond} = 24 \text{ acres}$$
$$S = 12 D \left(\frac{24}{1619} \right) = .1778 D ; F_{TF} = 2520 - 37.6 D$$

II Discharge Relations

1 - Spillway

50.2' wide rounded crest. Use Williams & Hazen "Hydr. Tables" & 49.2' wide effective crest, Crest elev. 470.7

Pond El.	471	472	473	474	475	476	477	474.5	475.5
q_1	0.58	4.91	11.48	19.73	29.37	40.30	52.34	24.39	34.70
Q_1	30	240	560	970	1450	1980	2580	1200	1710

2 - Crest Flow

Disch./ft = $q = 2.55 h^{1.5}$. Crest levels are: 52' @ el. 473.7; 120' @ el. 474.0; 134' @ 474.2; and 100' @ el. 474.5

Pond El.	474	475	476	477	474.5	475.5
Q_1	20	200	460	790	90	320
Q_2	—	310	870	1590	110	560
Q_3	—	240	930	1600	60	510
Q_4	—	90	470	1010	—	260
ΣQ_1	20	840	2630	4970	260	1650

III Test Flood Crest Discharge

Max. head on crest = $475.0 - 473.7 = 1.3'$

Discharge/ft = $q = 2.55(1.3)^{1.5} = 3.78 \text{ cfs}$

Where flow becomes critical: $y_c = 0.76 \text{ ft}$ & $V_c = 5.0 \text{ fps}$

IV Low Level Outlet

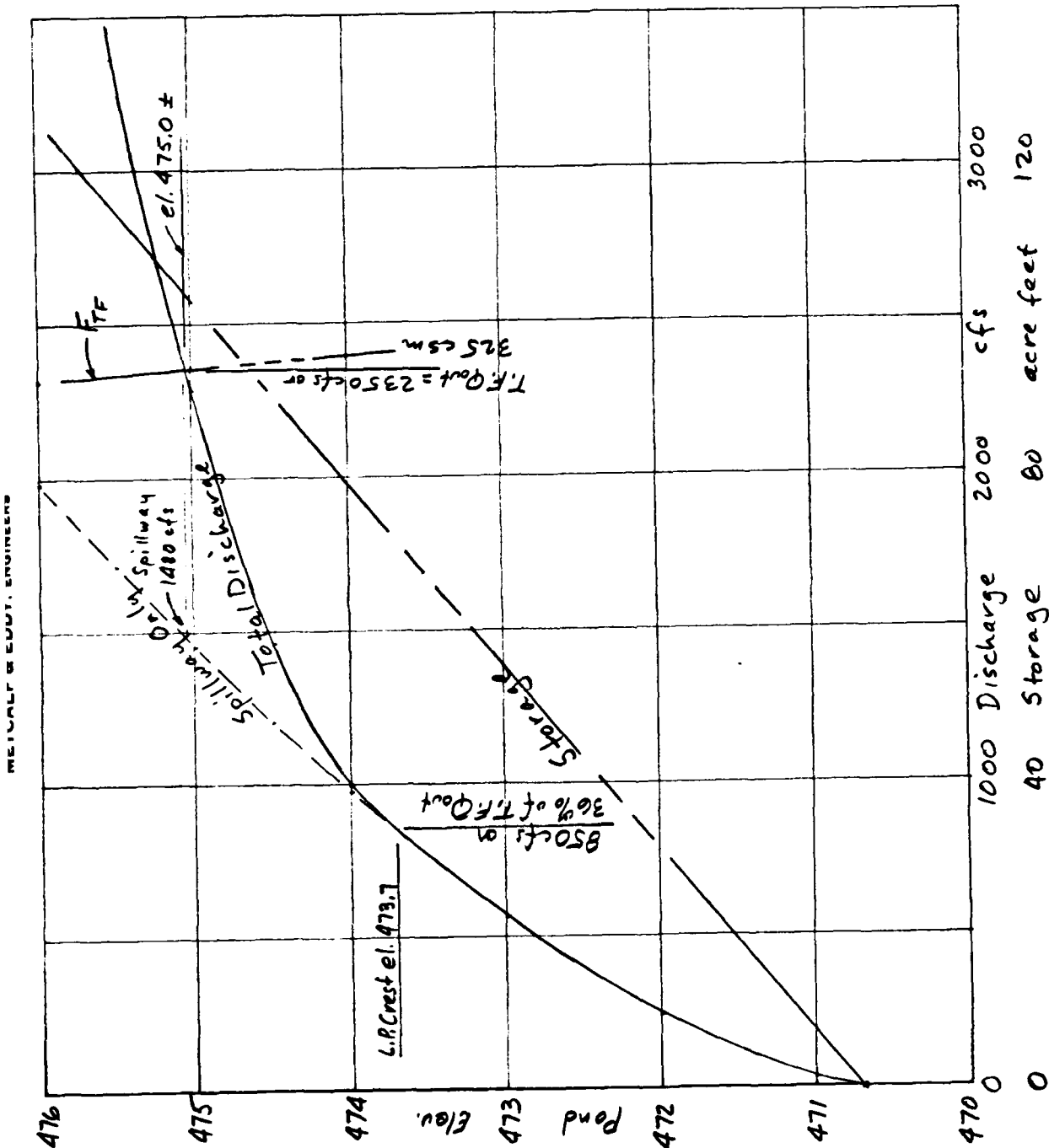
3' x 2.3' opening - ϕ el. 462.5 - acts as orifice - $Q = 0.6 A \sqrt{2gh} = 33.2 \sqrt{h}$

"water @ top spill., $h = 8.2'$, $Q = 95 \text{ cfs}$; water 1' lower, $Q = 69 \text{ cfs}$, $\bar{Q} = 92 \text{ cfs}$

Time to lower pond 1' = $\frac{24(43560)}{92(3600)} = 3.2 \text{ hours or } 189 \text{ minutes}$

Project Nat. Review of Non Federal Dams Acct. No. 6926 Page 3 of 4
 Subject Worcester County, Mass Comptd. By LEB Date 5/30/80
 Detail PIERCE POND Ck'd. By Marie Howard Date 6/5/80

⑤ Discharge, Storage & Storage Function vs. Pond Elevation



VI Failure of Dam

Peak Failure Flow:

Pond Elevation - 473.7 (L.P. Dam)

Toe Elevation - 460

$$Y_0 = 13.7$$

Dam Length Subject to Breaching = 94' (east of spillway)

$$W_0 = 40\% (94) = 38 \text{ feet}$$

$$Q_{P_1} = 1.68 W_0 (Y_0)^{1.5} = 1.68 (38) (13.7)^{1.5} = 3240 \text{ cfs}$$

Spillway Flow = 850 cfs ; Combined Flow = 4090 cfs.

Storage Volume Released:

Storage Above Spillway $24(3) = 72 \text{ ac ft.}$

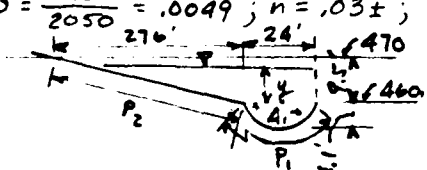
Storage Below Spillway $24(10.7)^{1/3} = 85.6 \text{ " "}$

$S = \text{Total Storage} = 157.6 \text{ " "}$

Channel Hydraulics:

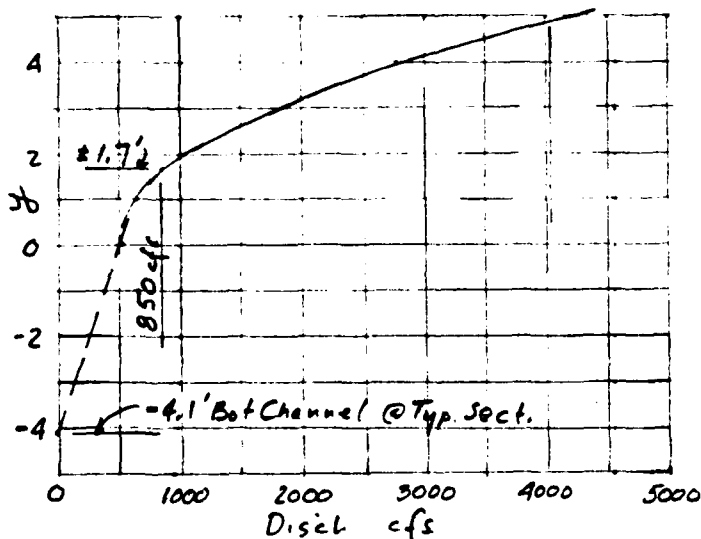
$$S = \frac{10}{2050} = .0049 ; n = .03 \pm ; V = 3.469 R^{2/3} ; P_1 \approx 27.4' ; P = P_1 + P_2 = 27.4 + 29y$$

$$A_1 = 75.9(4)^2 ; A = 75.9 + 24y + 14.5y^2$$



y	A	P	V	Q
0	75.9	27.4	6.84	520
5	558.4	172.4	7.59	4240
2	181.9	85.4	5.74	1040
4	403.9	143.4	6.92	2790
1	114.4	56.4	5.56	640

Water depth rises from 5.8' (1.7' overbank) to 9.0' (4.9' overbank), for a 3.2' rise in water level.



Time to Drain:

$$\frac{43560 (157.6)}{3600 (1/2) (3240)} = 1.18 \text{ Hours, or 71 Min.}$$

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

PIERCE POND DAM

NOT AVAILABLE AT THIS TIME

END

FILMED

8-85

DTIC